REMARKS

Claims 1-73 were pending when the present Office Action was mailed on March 27, 2009. In this response, claims 1, 14, 22, 42, and 50 have been amended to clarify certain features of these claims and to expedite prosecution of this application; the foregoing amendment are made without prejudice to pursuing these claims in unamended or other forms in a continuation or other application. Accordingly, claims 1-73 are currently pending.

In the Office Action dated March 27, 2009, claims 1-73 were rejected. More specifically, the status of the application in light of this Office Action is as follows:

(A) Claims 1-6, 11-16, 21, 42-45, 48-53, 56-59 and 61 were rejected under 35 U.S.C. § 102(b), as being anticipated by Gilbert (U.S. Patent No. 5,731,996); and

(B) Claims 1-3, 5-12, 14-20, 42-51, 53-56 and 58-60 were rejected under 35 U.S.C. § 102(e) as being anticipated by Govari (U.S. Patent No. 6,484,118); and

(C) Claims 1-73 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Gilbert in view of Govari, further in view of any of Montean (U.S. Patent No. 4,745,401), Fabian (U.S. Patent No. 5,057,095) and/or Mate et al. (U.S. Patent App. No. 2002/0193685).

As a preliminary matter, applicants wish to thank Examiner Kish for agreeing to schedule an in-person Examiner's Interview on Thursday, October 22nd at 10 AM EST to discuss the claims as amended in this response, as well as the claims as previously presented and subsequently rejected in the Office Action dated March 27, 2009.

A. Response to the Section 102(b) Rejection of Claims 1-6, 11-16, 21, 42-45, 48-53, 56-59 and 61

Claims 1-6, 11-16, 21, 42-45, 48-53, 56-59, and 61 were rejected under 35 U.S.C. § 102(b) as being anticipated by Gilbert. Applicants respectfully traverse this rejection. For the reasons explained below, this rejection is not proper because Gilbert does not disclose or suggest all of the claimed features. Independent claims 1, 22, 42, and 50 have been amended to clarify certain features of these claims and to expedite prosecution of this application without prejudice to pursuing these claims in unamended or other forms in a continuation or other application.

More specifically, amended independent claims include reducing, suppressing or accounting for the effects of interference. Applicants respectfully submit that Gilbert fails to teach or disclose this limitation, namely, providing a set of augmented measurements, such that interference at the sensors is expected to be a linear combination of that set and selecting the location associated with the set of reference measurements as augmented by the set of augmented measurements that most closely matches the received set of actual measurements. As a result, the Section 102 rejection of these claims should be withdrawn.

Furthermore, claims 1-6, 11-16, 21, 42-45, 48-53, 56-59, and 61 are patentable over Gilbert under Section 102 because this reference fails to teach or suggest "identifying a location associated with a set of calculated or interpolated measurements, wherein the set of calculated or interpolated measurements is derived from the sets of reference measurements." Thus, the pending claims are patentable over Gilbert. In contrast to the claimed invention, Gilbert selects from a set of hypothetical positions the position that best matches the actual measurements. In the current application, a similar result is achieved in the third step, by means not anticipated in Gilbert (see Claims 39-41).

As claimed in claims 14-17 and described in paragraph 0018, the identifying element involves creating an interpolation between adjacent reference measurements, and using this interpolation to calculate expected measurements at positions not given by reference measurements. These calculations allow the simulation of an infinitely divisible field, which is used to iteratively refine an approximation with a higher precision than that represented by the reference data. As described in paragraph 0026, this technique allows the use of a dramatically smaller set of reference measurements to achieve an equivalent accuracy in prediction.

Independent claim 1 and the dependent claims thereof are further patentable over Gilbert under Section 102 because this reference also fails to teach or disclose "receiving a set of actual measurements, each actual measurement indicative of a component of the magnetic field at each of a plurality of sensors." The current application demonstrates the collection of orthogonal components of the magnetic field, which facilitates the calculation of first- and second-order derivatives of field strength in each dimension. (See paragraph 0019, describing the three columns of $\mathbf{H}_b$, each indicating the sensitivity of the measurement to one of the x, y, or z components of $\mathbf{m}_b$.) These components are used in the final step to estimate the expected measurements at points not given by reference measurements, as well as in the objective function described in paragraph 0018, in order to predict a location where the objective function will have a desired value. Independent claims 42 and 50 and the dependent claims thereof can also be distinguished from Gilbert by this final interpolative step.

The amended independent claims include a method of calculating the position of a dipole in the presence of interference, including receiving a set of actual measurements, providing sets of reference measurements, providing a set of augmented measurements, and selecting the location associated with the set of reference measurements as augmented by the set of augmented measurements that most closely matches the received set of actual measurements. Gilbert fails to teach or disclose (a) the receiving a set of actual measurements, each actual measurement indicative of a component of the magnetic field at each of a plurality of sensors, or (b) the providing a set of augmented measurements of the amended independent claims therefore the Section 102 rejection should be withdrawn from independent claims 1, 22, 42 and 50 and the dependent claims thereof.

B. Response to the Section 102(e) Rejection of Claims 1-3, 5-12, 14-20, 42-51, 53-56 and 58-60

Claims 1-3, 5-12, 14-20, 42-51, 53-56, and 58-60 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Govari. The Examiner asserts that Govari discloses a system for determining the position of a medical device having a sensor comprising a plurality of radiator elements which anticipates the claims. For the reasons explained below, however, applicants respectfully disagree with the Examiner. Independent claims 1, 22, 42, and 50 have been amended to clarify certain features of these claims and to expedite prosecution of this application without prejudice to pursuing these claims in unamended or other forms in a continuation or other application.

More specifically, amended independent claims include reducing, suppressing or accounting for the effects of interference. Applicants respectfully submit that Govari fails to teach or disclose this limitation, namely, providing a set of augmented measurements, such that interference at the sensors is expected to be a linear combination of that set and selecting the location associated with the set of reference measurements as augmented by the set of augmented measurements that most closely matches the received set of actual measurements. As a result, the Section 102 rejection of these claims should be withdrawn.

Furthermore, Govari teaches bounding boxes that are used to map the difference between a theoretically calculated magnetic field and empirical measurements. These boxes are subdivided to the extent that the empirical measurements do not conform to the simple gradient predicted by the theoretical calculations, in order to produce an accurate calibration map. In the current application, subdivisible bounding boxes are used to cast the reference data as an N-ary tree so that it may be quickly searched for the grid point most closely matching a set of actual measurements. (See paragraph 0017 and claims 17-19 and 39-41.) Thus, while Govari uses subdivisible bounding boxes to generate calibration measurements, the current application uses them to calculate an approximate dipole location; and while Govari uses subdivisible bounding boxes to lower the resolution of its calibration measurements, the current application uses them to increase the resolution of a time-constrained search.

Furthermore, the claims are patentable over Govari under Section 102 because this reference fails to teach or suggest each element of the claimed invention. For example, Govari discloses an iterative positioning algorithm, wherein the field strength and a Jacobian (first order derivative) are calculated at a given point, and one of various descent or convergence algorithms is used to predict a point at which the calculated measurements will more closely match the actual measurements. This new point is used in the next iteration of the algorithm. At each iteration, the difference between calculated and actual measurements is expected to be reduced, and when this discrepancy falls below a predetermined threshold the point is considered a solution. (col. 9, lines 42-64).

In contrast, the calculated measurements of the claimed invention are derived from sets of reference measurements which are augmented to reduce the effect of interference. Thus, Govari discloses at each iteration calculating $\vec{H}(\vec{I})$ ("a [9,3] matrix describing the theoretical field in each of the x, y, and z directions attributed to each of the nine radiator coils at the approximate sensor location") directly from electrodynamic equations. (col. 12 line 26 through col. 13 line 42). Although Govari may interpolate from a lookup table to determine a Jacobian value (col. 14 lines 41-47), and presumably interpolates from the set of calibration measurements to determine a calibration factor, these figures merely supplement measurements that are themselves directly calculated from electrodynamic equations, and are not derived from reference measurements.

This distinction points to a deeper difference, which more broadly demonstrates the current application's novel approach to the problem of inferring a location associated with a set of readings. While Govari's method remains essentially an on-demand calculation of electrodynamic equations, which is supplemented piecemeal by lookup data, the current application casts free of this conceptual framework by using as the basis for all calculations a precalculated matrix unifying theoretical and empirical reference data, calibration information, and derived data in a single formula (paragraph [0030], equation 6), representing a continuous field specially suited to the rapid calculations required for real-time positioning. (See paragraph [0031]).

Additionally, various dependent claims are further distinguished from Govari by the use of both trilinear (first-order) and second-order interpolations in deriving calculated measurements at a hypothesized location. To the extent that Govari's use of Jacobian and calibration data interpolated from lookup tables represents a derivation of calculated measurements from a set of reference measurements, Govari fails to disclose a derivation of calculated measurements from a set of reference measurements using a combination of a trilinear and a second order difference interpolation. The incorporation of second-order interpolations eliminates discontinuities in the calculated gradient of the field, and more accurately matches the actual field topology, which is beneficial for a convergence algorithm that is intended to provide calculations at a resolution well below that of the reference measurements, and that incorporates both field strength and gradient in its calculations. Thus, Govari fails to teach or disclosure at least one element of the independent claims and the dependent claims thereof, and therefore, the Section 102 rejection should be withdrawn.

C. Response to the Section 103(a) Rejection of Claims 1-73

For at least the following reasons, Gilbert or Govari, whether considered individually or in combination, fail to disclose or suggest all of the features of these claims. Accordingly, the Section 103 rejection of claims 1-73 should be withdrawn. Independent claims 1, 22, 42, and 50 have been amended to clarify certain features of these claims and to expedite prosecution of this application without prejudice to pursuing these claims in unamended or other forms in a continuation or other application.

More specifically, applicants have amended independent claims 1, 22, 42, and 50 to recite additional features that further distinguish them over the cited references. In particular, as amended, each of the independent claims recite reducing, suppressing or accounting for the presence of interference. Applicants can find no disclosure in any of the cited references of accounting for the presence of interference. As such, Applicants respectfully submit that none of the references teach or disclose this limitation, for example, providing a set of augmented measurements, such that interference at the sensors is expected to be a linear combination of that set and selecting the location associated with the set of reference measurements as augmented by the set of augmented measurements that most closely matches the received set of actual measurements. Applicants further respectfully submit that the Examiner has For at least this reason, applicants submit that the claims are patentable over the cited references. Accordingly, applicants respectfully request that the Examiner reconsider and withdraw the Section 102 rejection of these claims.

Moreover, applicants submit that it is unclear how the Examiner is applying Gilbert to correct the deficiencies of Govari. In rejecting these claims, the Examiner states:

> Gilbert suggests that the processing method and apparatus may be used with any system intended to passively detect, locate and classify objects using their magnetic fields (column 3, 19-21). While not explicitly stating that a resonating magnetic circuit is incorporated into the object to be sensed, it is well known in the magnetic localization art to use such a marker.

(Office Action, March 27, 2009, p. 9) The Examiner appears to suggest that an implanted electromagnetic marker is disclosed in Gilbert. Without commenting on or agreeing with the Examiner's position noted above, applicants respectfully note that this does not correct the deficiency of amended independent claims 1, 22, 42, and 50, and previously pending unamended independent claim 62 and 68 to recite reducing, suppressing or accounting for the presence of interference. Applicants further submit that neither Govari nor Gilbert disclose or suggest augmentation of the reference measurements to account for the presence of interference. Moreover, applicants submit that it would not have been obvious to modify the cited combination of Govari and Gilbert to account for the presence of interference as suggested by the Examiner's rejection.

Furthermore, applicants respectfully submit that the Examiner's stated rationale is far too vague and conclusory to meet the *KSR* standard of an "articulated reasoning with some rational underpinning." For example, applicants respectfully submit that the Examiner has not provided an indication of where Govari, Gilbert or any cited art, individually or in combination disclose or suggest the claim language, as required. Accordingly, applicants respectfully request that the Examiner withdraw the rejection of the claims under 35 U.S.C. Section 103(a) over the combination of the cited art. However, if the Examiner elects to maintain these rejections, applicants respectfully request that the Examiner explain with the required specificity where Govari, Gilbert, Montean, Fabian and Mate disclose or suggest these elements.

D. Conclusion

In view of the foregoing, the pending claims comply with 35 U.S.C. § 112 and are patentable over the applied art. The Applicants accordingly request reconsideration of the application and respectfully submit that the application is in condition for allowance. If the Examiner has any questions or believes a telephone conference would expedite prosecution of this application, the Examiner is encouraged to contact Susan Betcher at (206) 359-8000.

In view of the above amendment, applicant believes the pending application is in condition for allowance. Please charge any deficiencies or credit any overpayment to our Deposit Account No. 50-0665, under Order No. 341148007US1 from which the undersigned is authorized to draw.

Dated: 9.28.09

Respectfully submitted,

By
Susan D. Betcher
Registration No.: 43,498
PERKINS COIE LLP
P.O. Box 1247
Seattle, Washington 98111-1247
(206) 359-8000
(206) 359-7198 (Fax)
Attorney for Applicant